

A New Subgenus of *Helminthoglypta*
(Gastropoda: Pulmonata: Helminthoglyptidae) with
the Description of a New Species from
San Bernardino County, California

by

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Abstract. *Coyote*, a new subgenus of *Helminthoglypta*, is described; it is characterized by a prominent bulge at the anterior end of the upper penial chamber and a papillose shell. It includes the so-called "Mojave Desert Series" and the polytypic *Helminthoglypta petricola* from the San Bernardino, San Gabriel, and Santa Ana mountains, California. The type species, *Helminthoglypta (Coyote) taylori*, sp. nov., is described from near the headwaters of the Mojave River, San Bernardino County, California.

INTRODUCTION

This paper continues a series of studies of new helminthoglyptid taxa from southern California based in part on land snails originally collected by the late Wendell O. Gregg (1898-1979). The other papers in the series include GREGG & MILLER (1976), MILLER (1985), REEDER (1986), REEDER & MILLER (1986a, b, 1987, 1988), ROTH (1987a), and ROTH & HOCHBERG (1988, this issue). As a result of earlier studies, Gregg and Walter B. Miller determined that the subgenus *Charodotes* Pilsbry, 1939, of the genus *Helminthoglypta* Ancy, 1887, was based on erroneous information about the structure of the upper chamber of the penis. MILLER (1981, 1985) synonymized *Charodotes* with the nominate subgenus. Gregg and Miller further determined that there were at least two distinct groups of species in *Helminthoglypta* (in addition to the nominate subgenus) that deserved subgeneric recognition. The first of these was described as *Rothelix* Miller, 1985; it is characterized by a relatively short and narrow upper penial chamber; a

large, sausage-shaped, lower chamber with a post-medial constriction; and a vagina that opens into the atrial sac near its posterior end.

The second group consists of species united in the possession of a distinctive, prominent bulge at the anterior end of the upper, double-tubed chamber of the penis. This group includes the "Mojave Desert Series" of PILSBRY (1939), the polytypic *Helminthoglypta petricola* (Berry, 1916) of the San Bernardino, San Gabriel, and Santa Ana mountains, and a number of other species from ranges peripheral to the Mojave Desert.

One such peripheral species was discovered by Dwight W. Taylor and Gregg in April 1950, along the headwaters of the Mojave River near the town of Cedar Springs in the San Bernardino Mountains. Miller and Gregg obtained additional material in 1963 from a locality which, along with the town of Cedar Springs, was later inundated by the waters of Silverwood Lake, impounded by Cedar Springs Dam. Fortunately, field investigations by Miller and Roth in early 1986 revealed that the species continues to thrive in a limited area below Cedar Springs Dam, and

the species is described herein, along with the subgenus to which it belongs.

Terminology for the elements of the reproductive system follows that of MILLER (1985), except that what MILLER (1985) referred to as the upper and lower "parts" of the penis are here called the upper and lower chambers of the penis.

SYSTEMATICS

Family HELMINTHOGLYPTIDAE Pilsbry, 1939

Helminthoglypta Ancey, 1887

Type species: *Helix tudiculata* A. Binney, 1843, by original designation.

Coyote Reeder & Roth, subgen. nov.

Type species: *Helminthoglypta (Coyote) taylori* Reeder & Roth, sp. nov.

Diagnosis: Shell medium-sized to small for the genus, depressed, umbilicate, with varying degrees of papillose sculpture. Reproductive system distinguished by a prominent bulge at the anterior end of the upper, double-tubed chamber of the penis.

All members of *Coyote* exhibit a prominent swelling at the anterior end of the upper, double-tubed chamber of the penis where it joins the lower, saccular chamber (Figure 1). This bulge is caused by a pronounced thickening of the walls of the inner tube of the penis, usually accompanied by enlarged, glandular pilasters along the widening lumen. The bulge projects permanently into the lower chamber, forming a short penis-papilla. While some specimens of *Helminthoglypta*, *sensu stricto*, occasionally exhibit a small penis-papilla in the lower part of the penis as a result of the process used in preparing anatomical whole mounts, they do not have the characteristic thickened walls of the anterior part of the inner tube shown by the species of *Coyote*.

In addition to the distinctive anatomy, all species of *Coyote* have papillose sculpture, ranging from a dense, overall papillation (e.g., *Helminthoglypta mohaveana* Berry, 1927), to the regular, discrete tubercles of *Helminthoglypta petricola*. The malleated sculpture of *Helminthoglypta tudiculata*, *Helminthoglypta fairbanksi* Reeder & Miller, 1986, and others of that group does not appear in species of *Coyote*. The clothlike sculpture of *Helminthoglypta nickliniana* (Lea, 1838) and its relatives is also absent from *Coyote*. Although some incised spiral lines occur in *H. petricola*, no species of *Coyote* exhibits the prominent grooves found in *Helminthoglypta fieldi* Pilsbry, 1930, *Helminthoglypta ayresiana* (Newcomb, 1861), and some other members of the *Helminthoglypta traskii* (Newcomb, 1861) group.

Based on an examination of their reproductive systems, the following additional species and subspecies are assigned to this subgenus:

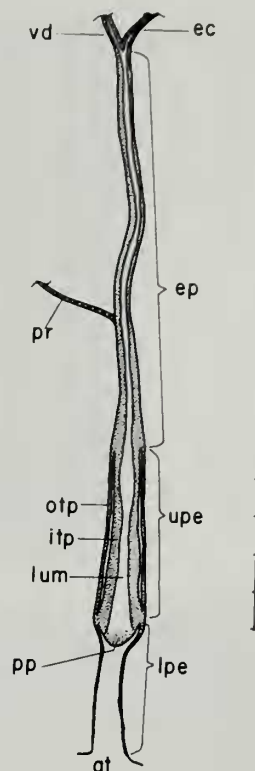


Figure 1

Helminthoglypta (Coyote) taylori Reeder & Roth, sp. nov., holotype SBMNH 34945, penis and epiphallus; drawn from projection of stained whole mount. Scale line = 10 mm. Abbreviations: at, atrium; ec, epiphallal caecum; ep, epiphallus; itp, inner tube of penis; lpe, lower chamber of penis; lum, lumen of penis; otp, outer tube of penis; pp, penis-papilla; pr, penial retractor muscle; upe, upper chamber of penis; vd, vas deferens.

Helminthoglypta fisheri (Bartsch, 1904)

H. petricola (Berry, 1916)

H. p. zechae (Pilsbry, 1916)

H. p. sangabrielis (Berry, 1920)

H. p. orotes (Berry, 1920)

H. graniticola Berry, 1926

H. mohaveana Berry, 1927

H. crotalina Berry, 1928

H. jaegeri Berry, 1928

H. fontiphila Gregg, 1931

H. greggi Willett, 1931

H. isabella Berry, 1938

H. micrometalleoides Miller, 1973

H. concolor Roth & Hochberg, 1988.

The reproductive anatomy of *Helminthoglypta caruthersi* Willett, 1934, is unknown and the species has not been collected since its original discovery. However, based on shell characters and geography, it also probably belongs to the subgenus *Coyote*. In addition, the middle Miocene (Barstovian) *Helminthoglypta alfi* Taylor, 1954, which

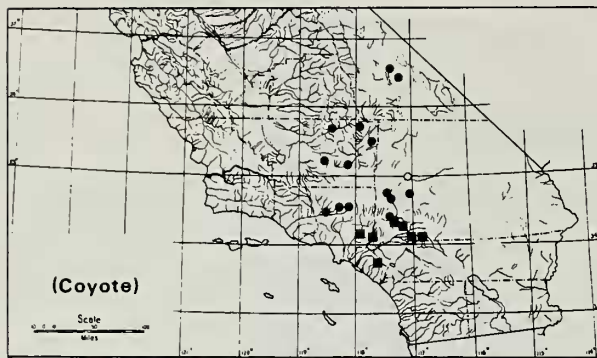


Figure 2

Map of southern California showing distribution of *Coyote*, subgen. nov. Solid circles, species of "Mojave Desert Series" of PILSBRY (1939); open circle, *Helminthoglypta alfi*, Barstow Formation (Miocene); solid squares, *Helminthoglypta petricola*.

TAYLOR (1954) assigned to the Mojave Desert Series, probably belongs to this subgenus.

Helminthoglypta venturensis (Bartsch, 1916), described from Ventura County but never subsequently recognized, may be another member of *Coyote*. The holotype is sculptured similarly to *H. taylori* and *H. fontiphila*. *Helminthoglypta venturensis* was originally described as a subspecies of *Helminthoglypta (Rothelix) cuyamacensis* (Pilsbry, 1895), but until living specimens are found and dissected, it cannot be firmly allocated.

Figure 2 depicts the distribution of the subgenus *Coyote*. The development of the Mojave Desert Series suggests an ancestral distribution along the course of the Mojave River and its tributaries prior to the rise of the Peninsular Ranges and Transverse Ranges to their present elevation and the (late Pliocene or early Pleistocene) onset of extreme aridity in the region. During much of this time, in the absence of a mountain barrier to the west, the major Mojave drainage may have been southwestward toward the Pacific coast, rather than eastward toward the Colorado River.

Etymology: *Coyote*, from the Nahuatl *coyotl*: the prairie wolf (*Canis latrans*), a figure in indigenous American mythology.

Helminthoglypta (Coyote) taylori
Reeder & Roth, sp. nov.

(Figures 1, 3–5)

Diagnosis: Shell of medium size for the genus, coarsely, densely papillose, above and below; papillae extending all the way to the peristome and into the umbilicus, confluent behind lip. Reproductive anatomy typical of subgenus *Coyote*, with prominent swelling of anterior portion of upper penial chamber forming a penis-papilla.

Description of shell of holotype: Shell (Figures 3–5) of medium size for the genus, thin, translucent, matte to silky,

depressed, umbilicate, umbilicus contained 11.0 times in major diameter. Spire very low-conic, whorl profile moderately convex, roundly shouldered; suture strongly impressed. Embryonic whorls 1.6, not strongly differentiated from first teleoconch whorl; initial half whorl smooth, thereafter with radiating rows of round to ovate papillae, grading after 0.25 whorl into irregular, granulose, predominantly radial wrinkling. Early teleoconch whorls with low, retractive growth rugae, strongest below suture, extremely fine radial wrinkling overall, and (most noticeably from third whorl on) minute, spirally elongated papillae in curved, obliquely descending rows. Papillae becoming larger and more irregular on subsequent whorls, running together in some places, especially on body whorl behind aperture; most papillae with depressed rim setting them off from wrinkled background surface. Papillae prominent on body whorl, continuing over base into umbilicus, sparser and less prominent on periphery and base of last growth increment. Base inflated, tumid around umbilicus, surface between papillae smooth. Body whorl rapidly descending, not constricted behind lip. Aperture subcircular except for interruption by parietal wall, oblique, plane of peristome at angle of 45° to vertical; lip slightly thickened and turned outward, most strongly reflected at base. Upper limb of peristome produced and slightly downturned; outer lip weakly sinuous. Inner lip encroaching slightly on umbilicus. Parietal callus thin, with irregular granulation; papillae of penultimate whorl showing through. Shell pale pinkish tan under a yellowish-brown periostracum; with a 1-mm wide russet spiral band on shoulder (prolonging trajectory of suture) with paler zones of equal width on either side of band.

Dimensions of holotype: Diameter (exclusive of expanded lip) 20.9 mm, height 12.0 mm, diameter of umbilicus 1.9 mm, 5.3 whorls.

Reproductive anatomy of holotype: The genitalia are, in general, typical of the genus with a long, spacious atrial sac having a small dart sac at its proximal end and having two mucous glands with mucous bulbs, the ducts of which unite before entering the proximal end of the atrial sac. The vagina opens into the distal end of the atrial sac. The spermatheca is spherical with a long duct having a spermathecal diverticulum diverging at a point approximately midway along the length of the duct. The penis (Figure 1) has upper and lower divisions, the lower chamber being a saccular, single-walled organ. The upper chamber is double-tubed, with the walls of the inner tube expanding abruptly at the anterior end to form a penis-papilla which projects into the lower chamber. The epiphallus is of moderate length with a short epiphallal caecum. The penial retractor muscle attaches to the epiphallus. Measurements of structures are as follows: penis 6.7 mm, epiphallus 8.9 mm, epiphallal caecum 18.2 mm, spermathecal duct 10.7 mm, spermathecal diverticulum 18.4 mm, vagina 6.0 mm.

Disposition of types: Holotype (shell and whole mount of reproductive system): Santa Barbara Museum of Nat-



Explanation of Figures 3 to 5

Figures 3–5. *Helminthoglypta (Coyote) taylori*, sp. nov., holotype SBMNH 34945, shell; top, apertural, and basal views; diameter 20.9 mm.

ural History, SBMNH 34945. Paratypes (15 shells): SBMNH 34946; additional paratypes (shells) deposited in Academy of Natural Sciences of Philadelphia, Los Angeles County Museum of Natural History, U.S. National Museum of Natural History, and the private collections of W. B. Miller, R. L. Reeder, and B. Roth.

Type locality: CALIFORNIA: San Bernardino County: bank of West Fork of Mojave River, at junction of Cedar Springs Road and Summit Valley Highway; elevation approximately 960 m (3150 ft); under cottonwood logs and decaying leaves. W. B. Miller coll., 9 May 1963.

Referred material: Additional specimens have been examined from the following localities (all, CALIFORNIA: San Bernardino County). The collectors' original topographic measurements, usually expressed in miles and feet, have been preserved, with metric equivalents added. The first three locality descriptions probably refer to essentially the same site.

West Fork of Mojave River on road to Cedar Springs. W. O. Gregg and D. W. Taylor coll., 12 April 1950 (WBM). West bank of West Fork of Mojave River, north of bridge on Cedar Springs Road, elevation 3150 ft [960 m]. E. P. Chace and W. O. Gregg coll., 7 April 1956; W.

O. Gregg coll., 4 November 1958 (WBM). West branch of West Fork of Mojave River north of bridge on Cedar Springs Road, 11.1 mi [17.8 km] east of [former] U.S. Highway 66. W. O. Gregg coll., 2 June 1963 (WBM). Along West Fork of Mojave River, approximately 100 yards [90 m] north of Cedar Springs Dam, elevation 3100 ft [945 m], under cottonwood logs. W. B. Miller coll., 11 February 1986 (WBM). Along unnamed creek tributary to West Fork of Mojave River, just north of California Highway 173, east of spillway of Cedar Springs Dam, under sycamore and branches on ground. B. Roth coll., 24 April 1986 (BR).

Discussion: In the material at hand, adult shell diameter ranges from 16.4 to 22.8 mm (mean of 20 specimens including holotype, 19.4 mm); height 9.7 to 12.9 mm (\bar{x} = 11.5 mm); number of whorls 5.0 to 5.6 (\bar{x} = 5.3). Diameter of umbilicus ranges from 1.4 to 2.5 mm (\bar{x} = 1.9 mm), contained 8.0 to 11.7 times in major diameter of shell.

The spire ranges from nearly flat to low-conic. The number of embryonic whorls ranges from 1.6 to 1.75. There is minor variation in the strength and regularity of papillation, and many of the paratypes show traces of incised spiral lines, particularly on the shoulder of the body whorl. The major trend of the microscopic periostracal wrinkling is radial on early whorls but becomes spiral on later whorls.

The shallow S-curve of the outer lip (as seen in lateral view), convex above the periphery and concave below, is quite distinctive. On most specimens, the lip is very little thickened and expanded at maturity; however, on one paratype the lip is turned outward into a 0.75-mm flange, most strongly reflected at the base. Several specimens have an internal varix (cf. ROTH 1987b) 1–2 mm behind a strong growth rest line.

Helminthoglypta taylori is larger than most species of the Mojave Desert Series and much more narrowly umbilicate. For example, in *H. mohaveana* the umbilicus is contained in the major diameter about 6.6 times; in *H. isabella*, about 7.5 times; in *H. jaegeri*, about 6.4 times. *Helminthoglypta fontiphila* differs in its generally smaller size (diameter 15.7–16.7 mm) and its finer, closer, overall papillation; in many specimens of *H. fontiphila* the papillae bear periostracal setae.

Approximately 7 km upstream from the type locality of *Helminthoglypta taylori*, a population of *H. petricola* occurs along the East Fork of the West Fork of the Mojave River, at an elevation of 1100 m in Miller Canyon (NW¼ SW¼ sec. 10, T. 2 N, R. 4 W, San Bernardino Base and Meridian). The spire is higher, the base more deeply rounded than in *H. taylori*. The shell is glossy, with smaller papillae in oblique series, often confluent into neat, low ridges sloping obliquely downward in the direction of growth; the papillae become sparse in the umbilical area. Weakly incised spiral lines are present on the base. There are 1.8 embryonic whorls, and the early sculpture consists of a

mixture of large and small granules. The suture is appressed, rather than strongly impressed as in *H. taylori*.

Habitat: The dominant vegetation in the region is Juniper-Pinyon Woodland (KÜCHLER 1977), grading to Chaparral up the canyon of the West Fork. Below Cedar Springs Dam, *Helminthoglypta taylori* occurs in a sandy, riparian zone with Fremont Cottonwood (*Populus fremontii* Wats.), Western Sycamore (*Platanus racemosa* Nutt.), and willows (*Salix* spp.).

Etymology: This species is named for our colleague, Dwight W. Taylor, who, with W. O. Gregg, first discovered it along the headwaters of the Mojave River.

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